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MINERALOGY AND PETROGRAPHY.[1]

The Granite of Santa Lucia, California, and a New Rock Variety Carmeloite.—The Santa Lucia Mountains[2] in the vicinity of Carmelo Bay, California, consist largely of a porphyritic granite whose phenocrysts of glassy orthoclase are corroded with inclusions of cloudy orthoclase, plagioclase, quartz, biotite, apatite and muscovite, which substances also constitute the groundmass of the rock. The striking feature of the inclusions is that their different areas are not only uniformly orientated with respect to each other, but they are also definitely orientated with reference to their host. They lie in certain definite planes within the phenocrysts, and their crystallographic axes are definitely arranged with respect to the axes of their hosts. The quartzes all lie with their vertical axes nearly perpendicular to the basal plane of the orthoclase, consequently in sections of the phenocrysts cut parallel to the basal pinacoid every included quartz grain exhibits the axial figure. Another feature worthy of notice is the tendency of the inclusions to idiomorphic forms, whereas, the same minerals in the rock's groundmass are always allotriomorphic. The facts of the idiomorphism of the inclusions and their definite orientation suggest to Lawson that these and their hosts are of contemporaneous age. This view is strengthened by the observation that many inclusions on the edges of the phenocysts have grown out into the surrounding matrix, in which, as has already been noted, the components are the same as those occurring as inclusions, but are much larger than these, and are allotriomorphically developed. This granite is cut by dykes of fine-grained aplite.

The rock to which the author has given the name Carmeloite, is a young volcanic, marked by all the characters of a recent lava. It is probably younger than the Monterey series of the Miocene, and older than the newer terrace formations of the region. Under the microscope the rock is seen to consist of phenocrysts of iddingsite, plagioclase and often augite in a matrix composed of a felt of small, lath-shaped plagioclase and granules of magnetite and pyroxene, lying in a glass containing numerons feebly polarizing globulites. There are six areas of the rock in the Carmelo Bay district, the occurrences differing mainly in the quantity of glass present, the presence or absence of iddingsite in the groundmass, and of augite among the phenocrysts. The occurrences differ also in their chemical composition, their silica contents varying between 52.83 % and 60.00 %. The analysis of one specimen (Sp. Gr. = 2.51--2.54).

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] A. C. Lawson, Bull. Dept. Geol. Univ. of Cal., Vol. I, p. 1.

SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	Ign.	Total
60.00	19.01	3.20	.68	tr.	4.10	1.28	2.79	6.97	4.30	= 102.33

Since the rock contains too much SiO_2 for a basalt, and too little for andesite, and because of the prominence of iddingsite as one of its essential components, the author prefers the new name, Carmeloite, to any already in use among petrographers.

The Ancient Rocks of Southern Finland.—In the German resumé of his article on the old rocks of southern Finland, Sederholm[3] divides these into two groups—the Archean and the Algonkian, and the first of these groups into two sub-groups. The older Archean consists of phyllites, gneisses, micaceous and other schists and granular limestone, cut by granite and diorite. All the members of the series have been subjected to dynamic metamorphism on an enormous scale. The schists are supposed to have originated both in sedimentary and in erruptive rocks. The younger Archean schists are phyllites, mica-schists, sandstone-schists, and a greenstone schist that was originally a uralite porphyrite occurring as a surface flow. These are cut by a red granite that is sometimes porphyritic and often pegmatitic. It shows no evidence of having been subject to great pressure, but nevertheless it is foliated—a consequence, according to the author, of flowage. The Algonkian rocks are all fragmental, and above them are the Rapakivi granite and a diabase, both of which are effusive. A younger olivine diabase and a panidiomorphic gabbro are also thought to be volcanic flows.

Petrographical News.—Smith[4] has discovered that the supposed peridotite[5] of Manheim, N. Y., is an alnoite in which there is no pyroxene. It contains a large quantity of melilite in the typical forms, but the mineral is positive in the character of its double refraction, like the artificial melilite made by Vogt. Incidentally the author mentions that positive melilite exists also in the nepheline basalt of Wartenburg, Bohemia, and in the alnoite from Alno, Sweden.

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[3] Fennia, 8, No. 3, p. 138.

[4] Amer. Journ. Sci., XLVI, p. 105.

[5] Cp. AMERICAN NATURALIST, Sept., 1892, p. 769.

About 600 miles north of the Falkland Islands in the South Atlantic, a fall of volcanic dust occurred on May 26, 1892. Palache,[6] who has examined some of the material, finds it to consist of fragments of glass and pieces and crystals of orthoclase, plagioclase, green hornblende and magnetite, with a very small quantity of what appears to be pyroxene. The character of the dust is thus andesitic.

New Minerals..—*Iddingsite* has been known for some time as a component of certain eruptive rocks from the far west, but not until Lawson[7] discovered it in the carmeloite of California, had its characteristics been carefully enough investigated to warrant its receiving a name. As described by Lawson, iddingsite occurs as a phenocryst with well-defined crystal outlines. It is of a bronzy color, has a very perfect cleavage and a hardness of 2.5. Its cleavage lamellae are brittle. Before the blow-pipe the mineral is infusible, though it loses water when heated. It is decomposed by acids after long treatment, but loses only its dark pigment, without alteration of its optical properties, when gently heated with hydrochloric acid. Maximum density $=$ 2.839. Its crystals possess in thin section the habit of olivine. If the cleavage is regarded as pinacoidal, the other crystallographic faces are the prism, with a prismatic angle of about 80°, and another pinacoid, both of which are perpendicular to the cleavage. The elongation of the crystals is in the direction of the second pinacoid. If the cleavage is regarded as parallel to the macropinacoid, b is in the cleavage plane, a is at right angles to it, and c is parallel to the elongation of the crystals. The plane of the optical axes is the brachypinacoid, and the mineral is orthorhombic and negative; $a = A$, $b = B$ and $c = C$. In thin section the color varies between yellowish green and chestnut brown, and tbe absorption is strong parallel to c. The absorption formula is $C > B > A$. The mean index of its fraction is low, and the double refraction strong. Qualitative tests showed the presence of silicon, iron, calcium, magnesium, sodium and water. In spite of the resemblance of its crystals to those of olivine, the author regards it as most probably an original separation from the magma that yielded the carmeloite.

Mackintoshite is the name given by Hidden and Hillebrand[8] to the original material from which the alteration product *thorogummite*[9] is derived. Only a very small quantity was available for study. This is described as opaque and black. Its hardness is 5.5 and density 5.438. Its crystals are square tetragonal prisms and pyramids like those of zircon. It is infusible before the blow-pipe, and is insoluble in the simple acids. It dissolves readily in a mixture of nitric and sulphuric acid, and in aqua regia. In nine-tenths of a grain of material, the following constituents were found:

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[6] Amer. Geol., June, 1893, XI, p. 422.

[7] Bull. Dept. Geol. Univ. of Cal., Vol. 1, p. 31.

[8] Amer. Jour. Sci.. XLIV, 1890, p. 98.

[9] AMERICAN NATURALIST, Jan., 1893, p. 72.

SiO_2	UO_2	ZrO_2(?)	ThO_2	$La_2O_3.Y_2O_3$	PbO	FeO	CaO	MgO	K_2O	$(NaLi)_2O$	P_2O_5	H_2O
13.90	22.40	.88	45.30	1.86	3.74	1.15	.59	.10	.42	.68	.67	4.81

The new mineral thus differs from thorogummite in the possession of one molecule of thoria.

Canfieldite is a new germanium mineral from somewhere in Bolivia.[10] Its crystallization is regular, small crystals being bounded by the octahedron and the dodecahedron. The hardness is 2.5, density 6.266, lustre metallic and color black with a purplish tinge. Its streak is grayish black and degree of fusibility 1.5 to 2. Upon analysis, the following result was obtained:

S	Ge	Ag	Fe. Zn.	Ins.	Total
17.04	6.55	76.05	.13	29	= 100.06

which corresponds to the formula Ag_8 Ge S_6. A re-analysis of the Freiberg argyrodite yields results that accord better with the formula above-given than with the formula Ag_6 Ge S_5 proposed for it by its discover, Winkler.[11] Both minerals have the same composition, consequently, since argyrodite is monoclinic, they are dimorphs.

Marshite.—This copper iodide[12] occurs at Broken Hill, New South Wales, as tiny crystals implanted on a siliceous cerussite. The crystals are probably hemihedral-tetragonal. In color they are reddish-brown, in lustre, resinous. They possess an orange yellow streak, are transparent and brittle.

Kehoeite, from Galena, Lawrence Co., S. D., forms seams and bunches in the galena of the Merritt mine. The material is white, amorphous and insoluble in water. Its analysis yielded Headden[13] the following figures:

P_2O_5	SO_3	ZnO	CaO	Al_2O_3	Fe_2O_3	MgO	Cl	H_2O	Ins.	Total
26.76	.50	11.64	2.70	24.84	.78	.08	tr.	31.06	1.76	= 100.02

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[10] S. L. Penfield, Amer. Jour. Sci., XLVI, 1893, p. 101.

[11] Jour. f. prakt. Chem., XXXIV, 1886, p. 177.

[12] C. W. Marsh, Proc. Roy. Sci. N. S. W., XXVI, p. 326.

[13] Amer. Jour. Sci., XLVI, p. 22.

corresponding to $R_3(PO_4)_2+2\ Al_2(PO_4)_2+2\ Al_2(OH)_6+21\ H_2O$.

Neptuneite and *Epididymite* are associated[14] with aegirite, arfvedsonite, eudialyte, etc., near Julianehaab, Kangerdluarsuk, Greenland. The former is found as short, prismatic monoclinic crystals, with a perfect cleavage parallel to ∞P. Their color is black in the larger crystals, but deep red brown in the small ones. Their hardness is 5–6, density, 3.234, and composition:

SiO_2	TiO_2	FeO	MnO	MgO	K_2O	Na_2O	Total
51.53	18.13	10.91	4.97	.49	4.88	9.26	= 100.69

These figures correspond to the formula $(\frac{3}{4}\ Na_2+K_2)\ Si_4O_9+(\frac{2}{3}Fe+\frac{1}{3}\ Mn)\ TiO_3$. Epididymite is regarded as a dimorph of eudidymite. It occurs in orthorhombic prisms elongated in the direction of their macroaxes. Their analysis: $SiO_2 = 73.74$; $BeO = 10.56$ $Na_2O = 12.88$; $H_2O = 3.73$, corresponds to the formula for eudidymite, viz.: $HNa\ Be\ Si_3O_8$. Density $= 2.548$.

Franckeite, from near Chocaya, in the Animas District, Bolivia, is an associate of the silver ores of the region. It occurs,[15] as a radial, aggregate, or as a structurelass layer of a dark gray or black substance, that is opaque and soft. Its hardness is about 2.75, and density 5.55. Its quantitative analysis yielded:

Pb	Sn	Sb	S	Fe	Zn	Gangue	Total
50.57	12.34	10.51	21.04	2.48	1.22	.71	= 98.87

while qualitative tests showed it to contain also about .1% of germaniun and a fractional percentage of silver. The mineral is a sulfo-salt of the the formala: $Pb_2\ Sn_2\ S_6 + Pb_2\ Sb_2\ S_6$. It resembles in appearance and in the nature of its components the plumbo-stannite from Moho in Peru, but differs from it in the proportion of its constituents.

Cylindrite owes its name to the cylindrical form that it so commonly assumes. It is described by Frenzel[16] as possessing a dark, lead-gray color and a metallic lustre. It is malleable, has a hardness of 2.5–3, and a density of 5.42. It occurs in cylindrical bodies imbedded irregularly in a granular lamellae mass of the same substance. An analysis of the mineral gave:

Pb	Ag	Fe	Sb	Sn	S	Total
35.41	.62	3.00	8.73	26.37	24.50	= 98.63

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[14] G. Flink, Geol. För. Förh., XV, 1893, p. 195.

[15] A. W. Stelzner, Neues Jahrb. f. Min., etc., 1893, II, p. 114.

[16] Ib., 1893, II, p. 125.

corresponding to $Pb_6\,Sb_2\,Sn_6\,S_2$. The mineral is easily decomposed by hot hydrochloric and nitric acid, but is scarcely affected by cold hpdrochloric acid. Like franckeite and plumbostannite, it is a South American mineral, occurring, as it does, at the Mina Santa Cruz, Poopó, Bolivia.

Hantefeuillite accompanies crystals of apatite, pyrite, iron and monazite at the apatite mine at Odegärden, Bamle, Norway. It is found in the greenish nodules composed of wagnerite and apatite, that are scattered through the apatite veins cutting gabbro. Michel[17] describes it as forming transparent, colorless monoclinic crystals radically grouped. Its hardness is 2.5 nnd density 2.435. The crystals are all tabular in habit, being elongated parallel to *c*, and flattened to $\infty P \breve{\infty}$. Their optical axes lie in the latter plane, and their optical angle has a value—$2V_{na} = 54° 23'$. An analysis gave $P_2O_5 = 34.52$; $MgO = 25.12$; $Cao = 5.71$; $H_2O = 34.27$, corresponding to $(Mg\,Ca)_3\,(PO_4)_2 + 8H_2O$, which is the guano mineral bobierrite in which Mg has been in part, replaced by Ca.

Chondrostibian, as its name indicates, is an antimony mineral occurring in grains. It is reported by Igelström[18] from the famous manganese mine Sjogrufran, Grythyttan, Sweden. It is found disseminated as grains through barite, which, with calcite and tephroite, forms a cryptio-crystalline mass. These grains constitute nearly 50% of some of the barite plates to which they impart a brownish tinge. The mineral itself is yellowish-red in color, though in large pieces it appears dark brownish red. It is weakly magnetic, and yields, upon analysis, figures indicating the following composition:

Sb_2O_5	As_2O_5	Mn_2O_3	Fe_2O_3	H_2O		Total
30.66	2.10	33.13	15.10	19.01	=	100.00

corresponding to $3R_2O_3\,Sb_2O_5 + 10\,H_2O$.

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[17] Bull. d. l. Soc. Franç d. Min., xvi, p. 38.

[18] Zeits. f. Kryst., xxii, p. 43.